



DYNAMIC POSITIONING CONFERENCE
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TESTING AND DATA COLLECTION

**Are we Testing too much?
A Class Perspective**

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Abstract

The worlds of Class surveys and Consultancy driven trials seem to be miles apart. Is that a reality, and if so, does that really need to be the case? On top of that, there are the often-heard statements from vessel owners that Class surveys are of limited value and only serve to satisfy getting the notation and verification that the vessel is technically in good condition regardless of the operation of the vessel. But is that a valid statement from owners?

To answer these questions, we need to examine the purpose of both of these surveys and have an appreciation for how and why these take place.

According to the International Association of Classification Societies (IACS) a class survey primarily has the following purpose:

Once in service, the owner must submit the vessel to a clearly specified programme of periodical class surveys, carried out onboard the vessel, to verify that the ship continues to meet the relevant Rule requirements for continuation of class. Class Rules do not cover every piece of structure or item of equipment on board a vessel, nor do they cover operational elements. Activities which generally fall outside the scope of classification include such items as: design and manufacturing processes; choice of type and power of machinery and certain equipment (e.g. winches); number and qualification of crew or operating personnel; form and cargo carrying capacity of the ship and manoeuvring performance; hull vibrations; spare parts; life-saving appliances and maintenance equipment. These matters may however be given consideration for classification according to the type of ship or class notation(s) assigned.

It should be emphasized that it is the shipowner who has the overall responsibility for the safety and integrity of a vessel, including the manner in which it is operated and maintained.

At the time of annual surveys, the ship is generally examined. The survey includes an external general inspection of the hull, equipment and machinery of the ship and some witnessing of tests, so far as is necessary and practical in order to determine whether the ship remains in a general condition which satisfies the Rule requirements.

The class renewal surveys/special surveys include extensive in-water and, in most cases, out-of-water examinations to verify that the structure, main and essential auxiliary machinery, systems and equipment of the ship remain in a condition which satisfies the relevant Rules.

According to the International Marine Contractors Association (IMCA), a consultancy driven survey has the following purpose:

The primary objective of the DP annual trials programme is to improve the safety of operations by:

- *Encouraging vessel operators to carry out detailed, auditable tests on an annual basis*
- *Verifying that the DP system is fully functional, well maintained and that the failure modes and effects analysis (FMEA) remains valid.*

The secondary objectives are:

- *To provide a common standard approach for the auditing and accepting of Dynamically Positioning (DP) vessels by client companies that adequately discharges their duty of care to the satisfaction of their regulatory bodies*
- *To make the DP testing and acceptance process more efficient and thus save the industry time and unnecessary cost*
- *To give failure response awareness, training and experience to DP personnel.*

From the two definitions, the worlds do not seem to be so far apart. The fact that a Class survey will not cover number and qualification of crew or operating personnel does not mean anything, as this will be covered by an ISM (International Safety Management) audit carried out by a Class organization. So, are the two worlds really so far apart? Or is this just something we keep telling ourselves?

If the difference is in the amount of testing, then why is that difference there? And are we maybe testing too much? After all many tests we perform during an Annual Survey/Annual Trials programme are actually performed many times during a year as part of the DP checklist before a vessel enters the safety zone of an Oil and Gas (O&G) asset or an offshore renewables site.

What then is the added value of performing a separate test programme, which often takes place under ideal circumstances with a perfect crew, but is also often hampered by the fact that some tests cannot be performed because targets or beacons are not available.

This paper will examine what the real differences are between a Class and Consultancy driven survey, asks what the benefits are off all the testing versus the cost of it, it will examine if testing can be done smarter (data driven) and even more cost effective, and it will ask the question whether or not we should go back and put more trust in our seafarers.

Abbreviation / Definition

BV	Bureau Veritas
Circ.	Circular
DP	Dynamic Positioning
DPVOA	Dynamically Positioned Vessel Owners Association
FMEA	Failure Mode & Effects Analysis
IACS	International Association of Classification Societies
IMCA	International Marine Contractors Association
IMO	International Maritime Organisation
ISM	International Safety Management Code
MoU	Memorandum of Understanding
MSC	Marine Safety Committee
O&G	Oil and Gas
RO	Recognised Organisation
SOLAS	Safety Of Life At Sea
UNCLOS	United Nations Convention on the Law of the Sea

Introduction

The worlds of Class surveys and Consultancy driven trials seem to be miles apart. Only by looking at a survey programme from a consultancy company and comparing this to the survey report from a Classification Society, this may give the impression that the gap is indeed very wide. The former is usually a lengthy document and specifies in minute detail the tests to be carried out and the results, whereas the latter is much shorter and only in headlines tells the owner regarding the vessel's compliancy with the rules. However, is there more than meets the eye and what do both documents represent?

On top of that, there are the often-heard statements from vessel owners that Class surveys are of limited value and only serve to satisfy getting the notation and verification that the vessel is technically in good condition regardless of the operation of the vessel. But is that a valid statement from owners?

This essay tries to shed a bit of light on the role of Classification in regard to Dynamic Positioning, how these worlds can be brought together a bit more.

Legislation

Classification has its roots in legislation, so therefore we need to go back in time and trace the history of legislation surrounding DP and examine what the legislation demands.

Until 1994 there was no formal legislation or procedures to ensure safe and predictable DP operations. The first guidelines were established by the IMO and approved by MSC 63 in May 1994, and provided the industry with an international standard for dynamic positioning systems on all types of vessels. These guidelines did not keep up with technology and therefore, in 2017, a new guideline was released reflecting the development in DP operations since 1994 and the current industry practice and DP technologies. MSC.1/Circ. 1580, was approved by the Maritime Safety Committee at its ninety-eighth session (7 to 16 June 2017), after its preparation by the Sub-Committee on Ship Systems and Equipment, at its fourth session (20 to 24 March 2017). The purpose of IMO MSC.1/Circ. 1580, and that of MSC/Circ. 645 which came before, is to recommend the design criteria, equipment, operating provisions and testing as well as a documentation regime for dynamic positioning systems in order to reduce the risk to the personnel, the vessel, other vessels or structures, sub-sea installations and the environment, while performing operations under dynamic positioning control.

However, there is an issue with the above. Many treat the IMO guidelines as mandatory regulation, but this is not the case. Both MSC/Circ. 645 and MSC.1/Circ. 1580 are guidelines. What then is a guideline? A guideline is:

Guideline means an agency statement or declaration of policy that the agency intends to follow, that does not have the force or effect of law, and that binds the agency but does not bind any other person.

IMO themselves state that guidelines are “*Not mandatory, but provide the Member States with guidance in framing national regulations and requirements.*”.

Therefore it is up to the flag states to regulate matters in regard to DP. Some flag states have adopted MSC/Circ. 645 and/or MSC.1/Circ. 1580 into their national maritime law, but most have not. For instance Dutch flag has got MSC/Circ. 645 enshrined within their policy rules (See Fig. 1). A policy rule is not mandatory regulation, but a general rule, not being a generally binding regulation, established by decision, concerning the balancing of interests, establishment of facts or interpretation of legislation in the exercise of a power of an administrative authority.

The screenshot shows the 'Netherlands Regulatory Framework (NeRF) - Maritime' website. The header includes the logo of the Human Environment and Transport Inspectorate, Ministry of Infrastructure and Water Management. The main navigation bar has tabs for 'Home', 'Advanced search', 'Tree view', 'Type of document', and 'Subjects'. A search bar contains the text 'Vul 1 of 2 woorden in' and a 'Zoeken' button. Below the navigation bar, a breadcrumb trail reads: 'Zeevaart / Seagoing ships > Policy Rules > IMO Instruments (Policy Rules) > Circulars (Policy Rules) > MSC Circulars (Policy Rules) > 0600 until 0799'. The left sidebar features a 'Geldigheid' (Validity) section with radio buttons for 'Nieuwste versies', 'Geldig vandaag' (selected), and 'Geldig op: dd-mm-jjjj'. Below this is a 'Thema' (Topic) section with a tree view of categories and counts: 'Zeevaart / Seagoing ships' (1783), 'Mandatory Regulations' (633), 'Policy Rules' (182), 'National Instrume...' (8), 'IMO Instruments (...)' (174), 'Codes (Policy Rul...' (2), 'Resolutions (...)' (46), 'Circulars (Poli...' (126), and 'MSC Circ...' (110). The main content area, titled 'Gevonden documenten', shows search results for '1 t/m 6 van 6'. It includes filters for 'Groepering: informatietype / documentsoort / geen' and 'Sortering: datum document / datum beschikbaarheid / titel'. The active filters section shows 'Geldig: vandaag'. The search results list three documents: 1. 'MSC/Circ. 645 Guidelines for vessels with dynamic positioning systems' (645 Guidelines for vessels with dynamic positioning systems, Circulaire niet in wetten.nl - International Maritime Organization (IMO), Beschikbaar: 06-09-2006, Geldig vandaag: van 06-06-1994). 2. '799 Guidelines for performance and testing criteria and surveys of expansion foam concentrates for fire-extinguishing systems of chemical tankers' (799 Guidelines for performance and testing criteria and surveys of expansion foam concentrates for fire-extinguishing systems of chemical tankers, Circulaire niet in wetten.nl - International Maritime Organization (IMO), Beschikbaar: 16-05-2006, Geldig vandaag: van 09-07-1997). 3. '798 Guidelines for performance and testing criteria and surveys of medium-'

Fig. 1 Netherlands Regulatory Framework - Maritime

This makes DP mostly not a statutory survey, as statutory surveys are only those where the survey concerns a matter of mandatory regulations issued by flag states.

So what is regulated by flag states? Article 94 of the United Nations Convention on the Law of the Sea (UNCLOS) on Duties of the flag states stipulates that the flag state shall “effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag” and take “such measures for ships flying its flag as are necessary to ensure safety at sea with regard, inter alia, to the construction, equipment and seaworthiness of ships...”, including, “those necessary to ensure that each ship, before registration and thereafter at appropriate intervals, is surveyed by a qualified surveyor of ships...”.

Article 217 of UNCLOS on Enforcement by flag states, stipulates that “States shall ensure that vessels flying their flag or of their registry carry on board certificates required by and issued pursuant to international rules and standards...” and “States shall ensure that vessels flying their flag are periodically inspected in order to verify that such certificates are in conformity with the actual condition of the vessels.”. Within the legal framework under IMO Conventions, SOLAS 1974 regulation I/6; ..., stipulates that the inspection and survey of ships shall be carried out by officers of the Administration. The Administration may, however, entrust the inspections and survey either to surveyors nominated for the purpose or to organizations recognized by it. Classification Societies are Recognised Organisations (ROs), and that means that flag states delegate a lot of certification to ROs, i.e. classification societies. The matters that

require certification on behalf of flag states are always statutory items and therefore matters of mandatory regulation. Certification and the inspection of statutory items are also inspected by port states. These can be flag states but not all flag states are port states, for instance Luxembourg. The mission of a port state is to eliminate the operation of sub-standard ships through a harmonized system of port state control. Any noncompliance will be recorded by port state control as a deficiency.

Classification societies are ranked by port states. The ranking of classification societies is determined by the number of deficiencies which have caused detentions of ships. These deficiencies are allotted to the respective RO if it inspected the ship shortly before the port state inspection or if the deficiencies were obviously already in place during the last inspection by the RO. The ranking of classification societies is published with the annual "RO performance table" of the Paris MoU (Memorandum of Understanding). This ranking can influence owners when choosing a classification society for (part of) their fleet.

Detentions do not only influence the position of the ranking scale of the MoUs, but it also influences the ranking of flag states with MoUs. Flag states with a higher number of detentions, caused by detainable deficiencies, will cause flags to become poor performers, which will lead ships flying these flags to be inspected more often or even be banned.

There is therefore a huge responsibility on classification societies to give priority to statutory items on board vessels.

Industry and DP

As with so many items that sooner or later become regulated by IMO, the origins of the DP guidelines lies with industry. In 1991, vessel operator representatives met oil company and government representatives to discuss and rationalise the auditing and testing of DP vessels. This resulted in the development of Dynamically Positioned Vessel Owners Association (DPVOA) guideline 112 UKOOA Part 2 – Guidelines for auditing vessels with dynamic positioning systems – which was published in 1993. The rationalisation process continued and was enhanced with the production of IMO Maritime Safety Committee (MSC) Circular 645 (IMO MSC/Circ. 645), which was adopted in 1994.

In 1995 the DPVOA merged with the Association of Offshore Diving Contractors (AODC) to form IMCA, which has issued since its inception many guidance documents. On the topic of surveys, the leading IMCA guidance has been IMCA M190 "Guidance for developing and conducting Annual DP Trials programmes for DP vessels". In this it is stated:

- Annual DP tests to ensure that the DP system has been maintained in accordance with applicable parts of the guidelines and is in good working order. Annual test should be conducted of all important systems and components to document the ability of the DP vessel to keep position after single failures associated with the assigned equipment class and validate the FMEA and operations manual;
- A periodical test performed after five years consisting of a complete test of all systems and components and the ability to keep position after single failures associated with the assigned equipment class.
- Independent verification of testing intended to prove the integrity of systems where the consequences of failure can be severe is desirable.

The guidance documents and the testing requirements within are however deeply rooted in the O&G industry, and the question can be rightly asked whether this is all applicable for the newly emerging offshore industries such as offshore renewable energy and offshore fisheries.

Class Surveys

As we have seen, industry guidelines lead to IMO guidelines, and following these, various classification societies released their own rules.

In general the Rules, for instance Bureau Veritas (BV) NR467, Rules for Steel Ships, published by a Society give the requirements for the assignment and the maintenance of classification for seagoing ships. This concerns mainly the technical condition of vessels.

The Rules, surveys performed, reports, certificates and other documents issued by the Society, are in no way intended to replace or alleviate the duties and responsibilities of other parties such as Administrations, Designers, Shipbuilders, Manufacturers, Repairers, Suppliers, Contractors or Sub-contractors, actual or prospective Owners or Operators, Charterers, Brokers, Cargo-owners and Underwriters.

Classed ships are submitted to surveys for the maintenance of class. These surveys include the class renewal survey, intermediate and annual survey, bottom survey (either survey in dry condition or in-water survey), tailshaft survey, boiler survey, and surveys for the maintenance of additional class notations, where applicable. For BV, such surveys are carried out at the intervals and under the conditions laid down in Part A of NR467. In addition to the above periodical surveys, ships are to be submitted to occasional surveys whenever the circumstances so require, and also when the Owner requires a specific survey in case of sales.

An annual survey is to take place at every anniversary of the initial class survey with a window of +/- three months. An intermediate survey will need to take place in the middle of the five year class period with a window of +/- 9 months. The renewal survey can start from 15 months before the expiry date of the class period.

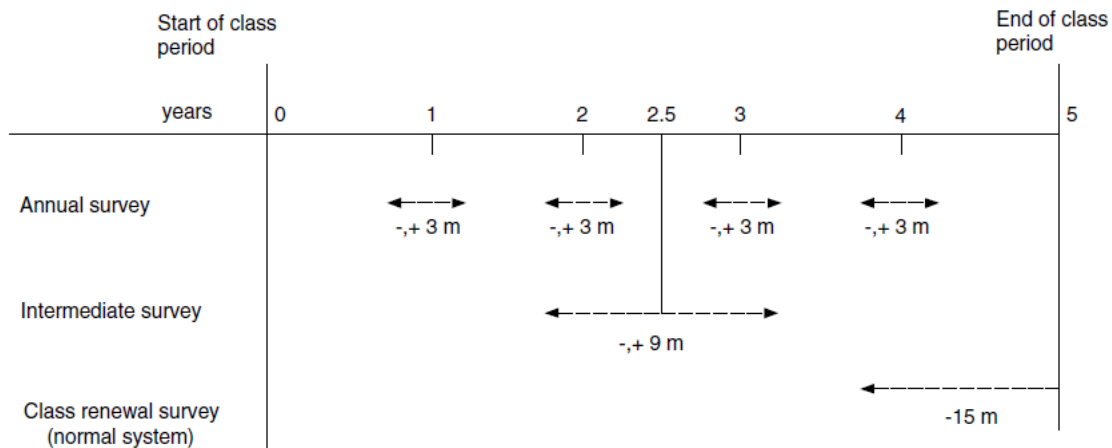


Fig. 2 Links between anniversary dates and the various class surveys

Class Rules however do not cover every piece of structure or item of equipment on board a vessel, nor do they cover operational elements. Activities which generally fall outside the scope of classification include such items as:

- design and manufacturing processes;
- choice of type and power of machinery and certain equipment (e.g. winches);
- number and qualification of crew or operating personnel;
- form and cargo carrying capacity of the ship and manoeuvring performance;
- hull vibrations;

- spare parts;
- life-saving appliances and
- maintenance equipment.

These matters may however be given consideration for classification according to the type of ship or (additional) class notation(s) assigned. One such item is manoeuvring performance for DP vessels, which is a key item for the additional DYNAPOS notation.

For DP vessels this is compounded because class rules need to cater for every DP vessel regardless of its industrial mission. On top of that, whereas a DP trials programme, mostly written in line with IMCA M190, covers every item applicable to DP, this is not the case for class surveys. Some parts of the aforementioned survey programme are covered by a class machinery survey, a class automation survey or the class electrical survey. So, it might seem that the DP portion of a class survey is so much smaller than an IMCA compliant DP Trials programme, but this could only be because class has a different focus and viewpoint on the components of the DP system.

Value add

Both classification societies and consultancies rely on visual inspections and testing as the basis for granting certificates or letters of compliance respectively. What is the value add of the testing witnessed by IMCA accredited surveyors and/or class surveyors?

Vessels are already performing a lot of testing during the year although this obviously depends on the industrial mission of the vessel. A supply vessel might make multiple entries into a safety zone on a monthly basis. Every time the vessel does this, multiple systems, such as the environmental sensors and position reference systems, are being tested under operational conditions. Crew very often test systems like uninterruptable power systems on a very regular basis as part of the maintenance programme. The question can therefore be raised why these then need to be tested again, with a surveyor in attendance?

Very often, but not always, surveyor attended tests take place under ideal weather conditions and even with a crew which might not be the normal vessel crew but a nominated test crew. During these dedicated trials very often mission equipment and its influence on DP cannot be tested. It might for instance not be possible to deploy pipe or cable, or simulate the effects of drilling equipment on the power distribution system.

Testing is also hampered if trials programmes include tests which are badly defined and do not seem to add value to the overall goal of the trials, being “*Verifying that the DP system is fully functional, well maintained and that the failure modes and effects analysis (FMEA) remains valid.*”, or “*General examinations of visible parts, and running tests of units and installation, including sample tests by simulation of different alarms, shutdowns, relevant back up and standby equipment, and switching modes.*”. Examples of these are test programmes containing tests which are not relevant to proving the single failure concept, or testing of equipment in its isolation. One such example of the latter is the testing of position reference systems one by one in isolation. When that happens under operational circumstances class needs to be informed because at that moment the vessel lost its DP notation. Class rules state that for equipment classes 2 (symbol R) and 3 (symbol RS), at least three independent position reference systems are to be installed and simultaneously available to the DP control system during operation.

More and more testing is being made difficult by manufacturers, either through the construction of the physical equipment or the intellectual property rights of software. Construction of equipment makes it sometimes difficult to disconnect wires without the chance of doing damage. And if manufacturers already have built-in safeties, what is the purpose of testing? The failure effects are after all already known from Factory Acceptance Testing of the equipment or system, and do not change.

What will the future bring?

Technology is moving forward at a rapid pace. The possibilities to record and store data are endless, but flag or port states may not allow for this to act as evidence or only in exceptional circumstances such as during the COVID pandemic. However, as we have seen, for many flag states DP is not statutory and therefore up to Class organisations what to accept.

Industry might then well be the deciding factor as legislation does not cover DP. How then can industry and classification get nearer to each other. Some might say more regulation. But as stated before, classification societies need to cater for a wide range of DP vessels with a multitude of industrial missions. What might be critical to a Dive Support Vessel, might not be so critical for a dredger with DP notation. Having multiple class notations is not the answer. There is too little appetite for that, and the upkeep can potentially cost a classification society more than the money earned with the notation. Maybe then the answer lies in the mutual understanding that class and industry might sometimes not have the same detailed targets, although both want predictable and safe DP operations.

For the Annual Trials, do we need to test to the extend we do now? Can rolling trials be institutionalised. Class will only sample test during an annual survey, not by choice but because the time on board is not sufficient for a surveyor to test and inspect every item in detail. If rolling trials are accepted by industry then maybe reciprocal acceptance by class and consultancy of each other's tests, if sufficient evidence is provided, can be an answer. Tests do not have to be repeated in that way and the attendance of only one surveyor will save both our customers money.

Should we put more trust in the crew? Class clearly puts the responsibility on the crew. As argued before, the crew does a fair amount of testing, both as part of the maintenance programme and as part of the procedures to approach to an asset. Acceptance of these regular tests, again with enough detailed proof, could serve as evidence that the single failure concept is not compromised.

Do we need to evaluate the amount of tests performed at sea? If the purpose of some tests is only to test whether an alarm is present, then can we not do this alongside? Testing alongside saves money and saves emissions. If we, as an industry, are trying to reduce our carbon footprints, then it is worthwhile re-evaluating the test programmes and the purpose of each test. To this end, it may be worthwhile investigating whether tests cannot be grouped together as system tests.

Conclusion

Are we testing too much? Maybe we do. Every time you test, there is a chance of doing damage to equipment under test. Should we therefore stop testing. NO! We need to test as we need to prove that the DP system is fully functional, well maintained and that the failure modes and effects analysis (FMEA) remains valid. We will still need to do this by general examinations of visible parts, and running tests of units and installation, including sample tests by simulation of different alarms, shutdowns, relevant back up and standby equipment, and switching modes. However, we need to test smarter with respect to systems and not individual components.

Furthermore, we need to accept each other's results, which includes testing performed by the crew, so that tests are not unnecessarily repeated.

Are the interests of Class and Consultancy so at odds? They have a different focus or angle, but both demand safe and predictable DP operations.

This essay is therefore part informative on the position of class and that of industry, but it can also serve as a start point for a discussion on how we can proceed. Test programmes become more at odds with the industrial missions of part of the DP industry and there is continued pressure on owners and charterers to reduce emissions. These issues need addressing sooner rather than later.

References

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